the difficulties of its measurement are less owing to the reduction of the disturbing effects due to the surrounding gas.

Prof. Rubens gave an account of his recent work on the optical properties of metals for long waves obtained by his method of "Reststrahlen." The radiation had about 100 times the wave-length of the sodium line, and it was found that in this region the reflecting powers of metals are independent of the wave-length. In these circumstances Maxwell's theory gives for a good conductor $1-R=36\cdot5/\sqrt{\kappa\cdot\lambda}$, where R is the amount reflected from the surface when unit radiation is incident on it, κ is the conductivity of the metal, and λ is the wave-length. The observations on pure metals and alloys agree with the theory, and show that the electrical conductivity of a metal may now be determined by a measurement of its reflecting power.

Prof. Wien, in discussing the question as to whether the ether moves with the earth or not, pointed out that according to the recent work of Lorentz, in which the electron is assumed to be ellipsoidal in form, attempts to settle the question based on interference or the rotation of the plane of polarisation would be without result. He thought himself the most promising method was a duplication of Foucault's revolving mirror method, the reflection taking place at the two ends from mirrors revolving with the same velocity. If the ether has a component movement along the line joining the mirrors the deflections observed at the two ends should differ.

Prof. Kayser directed attention to the defects of Rowland's scale of wave-lengths in view of the accuracy now attainable by interference methods of measuring wave-lengths. He considered that concave grating spectra were only suitable for interpolation purposes, and that the preparation of a standard scale should be taken in hand at once. Mr. Newall suggested that dark lines were more suitable than bright ones for this purpose.

Dr. Lummer, in describing his parallel plate spectroscope for the resolution of close spectral lines, pointed out the importance of high resolution if the effects of the mode of excitation or of an electrostatic field on the lines of a gas are to be investigated. Dr. Lummer showed his instrument in use in the Cavendish Laboratory, and was able to detect a difference between the lines of mercury, sodium, hydrogen, and helium when produced by Hertzian waves and when produced by the induction coil spark.

In connection with the preparation of the plates of the spectroscope, Lord Rayleigh mentioned that he had found the use of dilute hydrofluoric acid very effective in putting on the finishing touches to glass surfaces.

Prof. Wood described the interference method he had used to determine the dispersion of sodium vapour. The vapour was produced in an exhausted tube with plane ends surrounded by a wire by which the tube was electrically heated. Over a range extending to $\lambda^2/(\lambda^2-\lambda_m^2)=3900$ the results agree well with the formula $n^2=1+m\,\lambda^2/(\lambda^2-\lambda_m^2)$.

The discussion on "n-rays" was very one sided, as no one who spoke had succeeded in convincing himself that any effects he may have observed were not subjective.

Throughout the whole of the meeting communications dealing with radio-activity attracted a large amount of attention. Lord Kelvin described his models of radium atoms to give out α and β rays respectively. The former consisted of an "electrion" e placed at the point of contact of two spheres, through the volumes of which charges $-4e$ are uniformly distributed. When equilibrium is destroyed and the spheres move apart the electrion accompanies one sphere and we have the α particle. In the same way if two electrions e are in equilibrium at opposite extremities of a diameter of a sphere through the volume of which a charge $-\frac{1}{4}e$ is uniformly distributed, and equilibrium is destroyed, one of the electrions moves away from the sphere and gives the β ray.

Prof. Schuster described his apparatus in which radium is utilised in measuring the rate of production of ions in the atmosphere. Changes in the state of the atmosphere are found to take place much more rapidly than was anticipated, so that it is not advisable to use any method of measurement which involves the constancy of the state for more than five minutes.

Prof. Thomson gave an account of the work which has been done recently at the Cavendish Laboratory to determine whether ordinary matter possesses to a small extent the property of radio-activity so strongly shown by radium and polonium. His criterion for the possession of this property is that the substance shall be capable of producing electrical conductivity in the gas in a closed vessel in its neighbourhood. The difficulties of the investigation are due to the wide distribution of radium in soil, water, and air, and to the fact that the emanation from it settles on bodies left exposed to the air. A small quantity of radio-active material present in the body from either of these causes may be sufficient to mask the effect due to the substance itself.

From his observations Prof. Thomson concludes that each metal gives out a specific radiation which differs in its properties from the radiation sent out by other substances, and appears not to be a secondary radiation due to the impact on the substance of some form of penetrating radiation present in the atmosphere. The search for a radio-active gas produced by each metal has so far proved unsuccessful, but Prof. Thomson thinks there is some indirect evidence for the existence of such a gas.

Dr. Elster and Dr. Geitel pointed out that any results obtained by the use of the conducting property of a gas were open to the objection that the effects observed might still be due to traces of radio-active matter left in the apparatus, and not to the metals themselves.

Prof. Thomson's description of his work was necessarily much condensed, and physicists will look forward to the publication of a more complete account which will set aside this objection.

On the last morning of the meeting Prof. Fleming exhibited his apparatus for measuring the lengths of Hertzian waves such as are used in wireless telegraphy. A wire helix has attached to one end a metal plate which, with a similar plate attached to the apparatus in which the electrical oscillations originate, forms a condenser. The effective length of the helix is altered by a sliding conducting saddle, and the positions of the antinodes along the helix are determined by a Neon vacuum tube held perpendicular to the axis of the helix. From the dimensions of the helix the velocity of the waves along it can be calculated, and hence the frequency of the oscillation and its wave-length in air. Prof. Rubens stated that a similar method had been in use in Berlin for some time in connection with a portable apparatus for measuring the lengths of the waves used in the Slaby system of wireless telegraphy.

From the above notes of some of the matters brought forward it will be evident that the Cambridge meeting will hold its own as one of the most interesting of recent years.

C. H. LEES.

CHEMISTRY AT THE BRITISH ASSOCIATION.

THE proceedings of Section B (chemistry) were characterised not only by the general interest attaching to the numerous papers presented, but also by the unusually large attendances at the meetings, and chiefly by the presence of more than twenty distinguished Continental chemists, who made several important contributions to the business of the section.

The foreign visitors included Prof. Aschan (Helsingfors), Prof. Brühl (Heidelberg), Prof. Max Busch (Erlangen), Prof. Dieterici (Hanover), Dr. Étard (Paris), Prof. Franchimont (Leyden), Prof. M. Freund (Frankfurt), Prof. Gabriel (Berlin), M. le Comte de Gramont (Paris), Prof. Groth (Munich), Prof. Guye (Geneva), Prof. Haller (Paris), Prof. Kayser (Bonn), Prof. Knoevenagel (Heidelberg), Prof. Leduc (Paris), Prof. Richard Meyer (Brunswick), Dr. E. Noelting (Mülhausen), Prof. van Romburgh (Utrecht), Dr. Rupe (Bâle), Prof. I. Traube (Berlin), Prof. Walden (Riga), Prof. Wedekind (Tübingen), Prof. Wegscheider (Vienna), Prof. Wien (Würzburg), and Prof. Wolffenstein (Berlin).

The following papers were read:—On the bearing of the colour phenomena presented by radium compounds: W. Ackroyd. On the pentavalent nitrogen atom: Prof. O. Aschan. Saponarin, a glucoside coloured blue by iodine: Dr. G. Barger. The relation between the crystalline and the amorphous states as disclosed by the surface flow of solids: G. T. Beilby. The action of certain gases on glass in the neighbourhood of hot metals: G. T. Beilby. The change of conductivity in solutions during chemical re-

actions: P. V. Bevan. The union of hydrogen and oxygen in contact with a hot surface: Dr. W. A. Bone and R. V. Wheeler. On the formation of salts in solution, especially in tautomeric bodies: Prof. J. W. Brühl. On the active variety of chlorine: D. L. Chapman and C. H. Burgess. Hydroaromatic compounds: Prof. A. W. Crossley. On the energy of water and steam at high temperatures: Prof. C. Dieterici. A suggested explanation of the phenomena of opalescence observed in the neighbourhood of critical states: Prof. F. G. Donnan. On double acetylides: Major A. E. Edwards and Prof. W. R. E. Hodgkinson. Sur les manganates et les permanganates: Dr. A. Étard. Mesoxalic semialdehyde: H. J. H. Fenton. Note on the influence of radium radiations on atmospheric oxidation in presence of iron: H. J. H. Fenton. A reaction for ketoses: H. J. H. Fenton. A colour reaction for methylfurfural and its derivatives: H. J. H. Fenton and J. P. Millington. Ueber Isocysteïn (Isothioserin): Prof. S. Gabriel. Sur le spectre du souffre dans la photographie de l'étincelle des minéraux: M. le Comte de Gramont. Quelques observations sur le groupement des raies du spectre du silicium d'après l'effet de la self-induction, et sur leur présence dans les spectres stellaires: M. le Comte de Gramont. On crystal structure and its relations to chemical constitution: Prof. P. Groth. Methods of investigating alloys illustrated from the copper-tin series: C. T. Heycock and F. H. Neville. On some reactions between ammonium salts and metals: Prof. W. R. E. Hodgkinson and A. H. Coote. The stereochemistry of nitrogen: Dr. H. O. Jones. The constitution of nickel carbonyl: Dr. H. O. Jones. Exhibition of photographs of sections of an Australian siderite: Prof. A. Liversidge. On dynamic isomerism: Dr. T. M. Lowry. The oxidation of carbohydrates by hydrogen peroxide in presence of ferrous sulphate: R. S. Morrell and A. E. Bellars. Studies in the dynamic isomerism of α- and β-crotonic acids: R. S. Morrell and E. K. Hanson. The constitution of phthalein salts: Prof. Richard Meyer. The decomposition and synthesis of ammonia: Dr. E. P. Perman. Changes produced by the β rays: Sir William Ramsay. The action of organic bases on olefinic ketonic compounds: Dr. S. Ruhemann. (1) The vapour density of hydrazine hydrate; (2) the combining volumes of carbon monoxide and oxygen; (3) the action of heat on oxalates; (4) some alkyl derivatives of sulphur, selenium, and tellurion: Dr. A. Scott. A hexachlor-α-picoline and its derivatives: W. J. Sell. A new theory of the periodic law: G. J. Stokes. On the presence of arsenic in the body and its secretion by the kidneys: W. Thomson. On the velocity of osmosis and on solubility; a contribution to the theory of narcosis: Prof. Isidor Traube. Exhibition of effects produced by precipitating silver chromate in gelatin: Prof. Isidor Traube. The asymmetric nitrogen atom: Prof. E. Wedekind. On the products obtained by the action of tertiary bases on some acid chlorides: Prof. E. Wedekind. Pseudomorphosis in organic persulphates: Prof. R. Wolffenstein.

As in previous years, the practice of inviting two special reports on subjects of current interest and making these the basis of a discussion, met with considerable success, the communications of this order at the Cambridge meeting being made by Dr. H. O. Jones and Dr. T. M. Lowry; forming comprehensive summaries of our knowledge of the subjects discussed, which will be found very valuable by all who are engaged in teaching chemistry. The business of the section was brought to a conclusion on Tuesday afternoon by an address from Sir James Dewar on new low temperature phenomena and their scientific applications; this attracted a very large and appreciative audience, who followed the novel experiments with the greatest interest. The committees of the previous year were re-appointed, and two new committees were formed to deal with the subjects of dynamic isomerism and transformation of diazonium compounds and allied substances.

Although the neighbourhood of Cambridge does not offer many opportunities for studying industries of chemical interest, a very successful visit was made to the woad works near Wisbech, a description of which has appeared already in the columns of NATURE. Visitors were shown the processes of cropping, milling, and balling, and examined the drying racks on which the balls are placed until the second milling process, which takes place in November.

GEOLOGY AT THE BRITISH ASSOCIATION.

FOLLOWING the president's address, which has already appeared in these pages, Dr. Marr gave an address on the geology of Cambridgeshire. He described the main physical features of the county, and showed their relations to geological structure. Opportunities were afforded during the meeting, by afternoon excursions, for visiting most of the typical sections of Jurassic and Cretaceous rocks exposed near Cambridge, including the interesting occurrence of Upper Gault at Barnwell, in which Mr. Fearnsides recently discovered an unsuspected fauna. The Boulder-clays and gravels which cover a large portion of the surface of Cambridgeshire were dealt with by Dr. Marr in his address, and were further described by Messrs. Fearnsides and Rastall, who gave an account of the boulders collected by the members of the Sedgwick Club. Mr. F. W. Harmer, in a comprehensive paper on the Great Eastern Glacier, showed that its product, the Chalky Boulder-clay, extending over a great part of the eastern counties, has a palmate form, its lobes radiating from the great depression of the Lincolnshire and Cambridgeshire fens. The fens were the centre whence the Chalky Boulder-clay was distributed, and formed the quarry out of which was excavated the enormous mass of Jurassic material which forms the matrix of this deposit.

Much of the Boulder-clay about Leicester, in his opinion, was due to the ice stream of the Trent Valley having been piled up, upon the high lands to the east of Leicester, by the pressure of ice descending from the Pennine Chain. He found no evidence to show that any considerable amount of ice entered East Anglia through the Wash gap.

Mr. W. Whitaker showed that in the valley of the Stour deep channels filled with drift have been proved by borings, one of them having a depth of no less than 477 feet. How these channels extending below sea level have been excavated is a moot point, and in this connection Mr. Lamplugh pointed out that Dr. Gilbert has found in Alaska that the excavating power of ice debouching on the sea is carried on below sea level, and until the depth of water is sufficient to float the ice.

In a note on a small anticline in the Great Oolite series at Clapham, north of Bedford, Mr. H. B. Woodward directed attention to a small fold trending N.N.W. to S.S.E. Its direction is contrary to the minor undulations affecting the Oolitic strata of the district, and while there is no evidence to connect the disturbance with glacial action, there is equally no evidence against such a supposition.

Mr. John Spiller gave an account of the recent coast erosion in Suffolk, between Dunwich and Covehithe. At Easton losses of 39 feet and 55 feet have occurred at different points during the past two years.

A report on the fossiliferous drift deposits at Kirmington was read by Mr. J. W. Stather. A boring conducted by a committee appointed by the association proved solid chalk to exist at a depth of 93 feet, and above this were two boulder-clays separated by a bed of shingle and 18½ feet of laminated warp with estuarine shells. Thin peat and sand containing fresh-water shells were found at the base of the warp. The plants in the peat, according to Mr. Clement Reid, indicate estuarine conditions, and suggest a subarctic climate. Another boring at Great Limber showed a similar laminated warp, but without shells, and it does not rest on Glacial clays.

Mr. Edward Greenly, in describing the glaciation of Holyhead Mountain, showed that the northern and eastern slopes are strongly rubbed and rounded in a general N.E. to S.W. direction, and striæ occur on the summit 721 feet above sea level, parallel with the trend of the general glaciation of Anglesey. Mica schists, occurring *in situ* at a level of 200 to 300 feet, have been raised 500 feet above their source. He ascribes the phenomena to the action of land ice, and some ill-defined moraines composed of local débris he thinks may be due to small local glaciers.

Prof. P. F. Kendall presented a report of the committee on erratic blocks, and later exhibited a model of the Cleveland area showing glacier-lakes. He incidentally referred to a boulder of Red Crag of the Waltonian type found near Sherringham on the occasion of the association excursion to Cromer. The Rev. W. L. Carter, in describing the